Item-by-item response to Reviewer #3

The authors gratefully acknowledge the anonymous reviewer for carefully reading the manuscript and providing constructive comments. This document contains the authors' responses to comments from reviewer #3. Each comment is discussed separately with the following typesetting

*****Reviewer's comment

Author's response

* The paper devoted to application of Linear Estimation technique to retrieval of aerosol size distribution parameters from spectral aerosol optical depth measurements. Presented in the paper analysis and results of validation are comprehensive and convincing. Described method opens new possibilities of aerosol characterization from AERONET direct sun- and star-photometer measurements. As it follows from the paper, to retrieve aerosol size distribution parameters using LE technique, the kernel matrix K is necessary. This matrix depends on particles radius and complex refractive index. It is not clear from the paper how algorithm deals with the complex refractive index. In this content authors write: "No significant dependencies on particle refractive index are expected . . . when using inversion algorithm that use only AODs as input data". I can't agree with this statement especially taken into account that, as it is written in the manuscript, real part in the algorithm is allowed to vary from 1.35 to 1.65 and imaginary: from 0 to 0.015. In this case essential variation of the complex refractive index will give variation of extinction cross section and thus effect the size distribution parameters. Authors should address this question in more details.

We agree with the referee that the inversion depends on the refractive index. As we have already mentioned responding to referee 2, we consider a search space for refractive index also. The retrievals of refractive index by Linear Estimation possess very large uncertainties, and that is why we do not show them. However, the retrievals of effective radius and particle volume content possess uncertainties below 40 %.

Simulations were performed for the search space and by fixing the refractive index at specific values, both for Scenario I and II used in Section 3. The results of these simulations showed the patterns mentioned by the referee. But the most important results revealed is that all these differences are within the 40% uncertainties claimed. This uncertainty threshold is supported by the comparisons done with correlative retrievals by the operational AERONET algorithm. We will introduce corresponding revisions to manuscript to clarify this point.

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